

is obtained little short of the desired 3'6". This result must appear sufficiently striking, but it may be seriously doubted whether even an approximate estimate of the total bulk of sedimentary strata can possibly be arrived at. Such an estimate must inevitably rest in great part on a basis of pure speculation. Not only are we ignorant, as regards huge areas, of the thickness of these strata, but immense tracts still remain unexplored so far as their geology is concerned. Further, the boldest guess can tell us little of sedimentary strata hidden beneath the surface of the ocean, and it may be looked upon as a lucky coincidence that Prof. Joly is able to attain the above result when restoring to the estimated sedimentary rocks the sodium of the sea. The question also of pre-Cambrian rocks of sedimentary origin appears here to be too lightly passed over, for although so little is known of their actual extent, the trend of recent researches has been to show that they may constitute a not unimportant fraction of the total sediments formed. It is scarcely necessary to recall the fact that the earliest known fossil faunas, including marine forms of comparatively high organisation, clearly indicate that a habitable ocean had already for long ages been in existence.

The unequal ratios of the alkalis in the ocean and in the rivers respectively next receive attention. The fact that the ratio of potash to soda is very much higher in the rivers than in the sea, is believed by the author, not to indicate that the rivers now contain more potash relatively to soda than in former times, but is to be accounted for by the constant abstraction of potash from the ocean, largely in the glauconite now forming on the sea floor, and so extensively distributed in the sedimentary strata. Stress is also laid on the fact that potassium brought from the atmosphere by rain tends to become retained upon the land, while the sodium is more readily returned to the ocean. In arguing for the uniformity of denudation by solution in past times, Prof. Joly brings forward some good reasons to show that the distribution of land and sea can have varied but little. As regards the greater exposure of igneous rocks in early times some interesting points on the nature of weathering and soil formation are noted, and it is concluded that the unequal percentage of sodium in the igneous and sedimentary rocks would, as regards supply to the ocean, be counterbalanced by the different rates of weathering. Sedimentary rocks, poorer in alkalis, allow of more rapid denudation.

In the concluding section of this paper the action of the ocean as an agent in solvent denudation is dealt with. Such action, the author maintains, is carried on chiefly along the coast lines, and is very small as compared with that effected by rain and river waters. Experiments are quoted to show that the power of sea-water to decompose felspar is minute in comparison with that exerted by fresh water. It is further pointed out that the volcanic *débris* of oceanic deposits have the alkali ratio of igneous and not that of sedimentary rocks. A correction of half a million years on the original time estimate is thought to be a sufficient allowance to make for the solvent denudation by the ocean. But even allowing, as held by the author, that chlorides other than sodium chloride may in past times have in some measure retarded solvent denudation by the ocean, it may be suggested that subaqueous volcanic action, at one time more frequent than at present, with its attendant conditions of exceptional temperature and pressure, may by frequent repetition through vast periods of time have played some part in aiding this process.

Prof. Joly does well in finally recognising the uncertainty attending his corrections on the original estimate of geological time, and he certainly allows no too wide a margin for error in the final result when he claims that "a period of between eighty and ninety millions of years" has elapsed since the land first became exposed to denuding agencies. For not only in the data upon which the corrections are founded, but also in the factors employed in the original calculation, there is to be found comparatively little of certainty and much that is purely speculative. In this latter category must be placed the supposed sequence of events at the first cooling of the globe. The relative intensity of geological activities in the past is also unknown to us, and the possibilities as regards the activity of the sun and the influence of the moon in modifying meteorological agencies during the earlier chapters of the earth's history appear to render hopeless the final solution of the time-problem by such a method as that here employed. But in this interesting treatise Prof. Joly has with marked ability and originality attacked a most difficult question, and his novel theory calls for the fullest consideration from all geologists and physicists.

NOTES ON SATURN AND HIS MARKINGS.

THE possessors of telescopes will welcome the reappearance of Saturn as a rather conspicuous object in the evening sky. The planet now rises at 7h. 40m. p.m., and remains visible afterwards throughout the night, but unfortunately his altitude is extremely low. His southern declination being $22\frac{1}{2}^{\circ}$, his position is only 16° above the horizon at Greenwich even at the time of his meridian passage. Notwithstanding these unfavourable conditions, excellent views may, however, occasionally be obtained of his general aspect. From stations in the southern hemisphere the planet may be seen under the best circumstances.

This planet with his rings, belts and moons, forms a picture quite unique of its kind. The globe is greatly compressed at the poles, like that of Jupiter, and the rate of its axial rotation similarly rapid. We recognise also in the dusky bands of Saturn another parallel to the visible lineaments of the "Giant Planet," but there is a marked difference as regards the distinctness with which the details on the two bodies may be viewed. Jupiter's large disc and superior brilliancy enable the markings and their variations of form and motion to be followed with great facility and certainty. Saturn being much smaller and fainter is more difficult, especially as regards the more delicate features. Cassini's division in the rings and the principal belt on the globe may be distinguished with a two inch refractor, but Encke's division in the outer ring is a doubtful, or probably a very variable feature, which at certain times appears to be missing altogether, while on other occasions it is described as faintly outlined as a pencil-like curve at the ansæ.

That there are occasional irregularities on Saturn is proved beyond contention. In 1790 Sir W. Herschel remarked a very dark spot on the limb, and in 1793 noticed some irregularities in a quintuple belt which enabled him to ascertain the planet's rotation period. The large white spot seen by Prof. Hall and others at the close of 1876 affords a good instance of change, and it is well-known that the disposition and number of the belts vary from year to year. We naturally conclude that these belts must occasionally exhibit irregularities like those of Jupiter.

The planet is now presented to us at an angle which permits the ring system to be seen with splendid effect. We now view the northern side of the ball and rings, and this will continue to be the case until 1907.

Perhaps there is no object upon which it is easier to exercise the imagination than upon Saturn. And there is probably no orb in reference to which more errors in detail have been made, though both Mars and Venus have encouraged a large number of observational misconceptions. Many of the abnormal results reported in recent years, and due to small instruments, may be safely dismissed, for they are not only doubtful but, when all the conditions are considered, ridiculous, and palpably the outcome of unconscious suggestions of the imagination. Yet there can be no question as to the good faith of those who are responsible for some of the wonderful sightings lately published. They honestly believe they have seen what they have drawn, and as a matter of fact it is an extremely difficult point to distinguish between real and imaginative features on Saturn. The trembling of the image, its faintness under high power or its smallness under low power encourage much fictitious detail which every observer cannot regard as illusory.

Some of those who claim to have seen many irregular markings on this beautiful planet ascribe their success to special training; but this explanation will scarcely stand, for others of equal experience and using more powerful appliances have quite failed to observe them. The difference is not one of sight, of practice, or of instrumental means. It resolves itself into a question of personal ethics. There are men who will report nothing but what they are absolutely certain is presented to their eyes, and are unbending in their regard for the truth; there are others who, though equally sincere in intention, are not so reliable in their judgment, and accept features which are apparently glimpsed, but which are in reality prompted by the imagination on an unsteady and very delicate object.

It is to be hoped that time will eliminate all the fanciful representations of Saturn which recent observations have so abundantly supplied. The period has now arrived when the planet may be telescopically surveyed with a view to obtain a really sound knowledge of such features as are portrayed in moderately powerful instruments. Those who have employed large and small telescopes in planetary observation aver that the former are more effective than the latter; but it is remarkable

that small instruments have been the means by which a large amount of useful work has been done in this field of observation. It is also an unavoidable conclusion that many of the mistakes in planetary work have been due to inadequate power and light in the appliances used. Possibly during the next few months some of the existing discordances may be cleared up, and some new facts learnt concerning this the most beautiful planet of our system.

There was an interesting occultation of Saturn by the moon on June 13, but at Bristol clouds interfered with observation. At Yeovil, Somerset, the Rev. T. E. R. Phillips watched the phenomenon with a 3-inch refractor. There will occur another event of this kind on September 3 next, when the planet will disappear at 7h. 16m. and reappear at 8h. 11m. p.m. Occultations of Saturn are somewhat rare, the last, prior to that of June 13, occurring twelve years ago, viz. on October 1, 1888.

The planet may now be studied with advantage from southern observatories, where his altitude will be considerable and conduce to that excellent definition which is so necessary for the detection of faint and delicate markings. As every opposition it seems necessary that the number and arrangement of the various belts should be noted. A dark polar cap should be looked for, and any irregular appearances, such as dark and light spots on the dusky belts or intervening zones, should be carefully recorded. It is unfortunate that the results obtained in previous years are not sufficiently accordant to be of much service. In some cases where one observer has drawn one or two belts, another, equally experienced and with more powerful means, has represented seven or eight. Certain observers see the belts and zones mottled with spots, while others describe the aspect as perfectly smooth and quite devoid of all such irregularities. The evidence is, in fact, so conflicting that new and thoroughly trustworthy observations are greatly needed to set at rest the actual character of the details visible on this exceedingly attractive object. W. F. DENNING.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—On April 27, 1899, an anonymous gift of 5000*l.* was made towards the building of a pathological laboratory. The donor now allows his name to be made known, and a decree will consequently be proposed on July 7, that the thanks of the University be conveyed to Ewan Richards Frazer, B.M., Balliol College, for his munificent donation to the pathological laboratory.

CAMBRIDGE.—The annual report of the Cambridge Observatory appears in the *Reporter* for June 30. It includes an account of valuable work done with the Newall telescope, and of the steps taken to bring to perfection the Sheepshanks photographic equatorial. The binary character of a Aurigæ was announced as discovered at the Observatory two days before the arrival of Prof. Campbell's independent publication from the Lick Observatory.

Scholarships, or exhibitions, in natural science have been awarded at the following Colleges thus :

Peterhouse : Lee.

Gonville and Caius : Cleminson, Burne, Garnsey, Lock, Macfie, Rittenberg, Thornton.

The Hopkins Prize for the period 1894-97 has been awarded to Mr. J. Larmor, F.R.S., of St. John's College, for his investigations on the Physics of the Aether and other valuable contributions to mathematical physics.

Mr. William Ritchie Sorley, formerly Fellow of Trinity College, has been chosen Knightsbridge Professor of Moral Philosophy in the place of Dr. Henry Sidgwick, who has resigned in consequence of ill health.

PROF. SIMON NEWCOMB has had the degree of doctor of laws conferred upon him by the University of Toronto.

PROF. J. H. POYNTING, F.R.S., has been elected Dean of the Faculty of Science of the University of Birmingham.

THE honour of knighthood has been bestowed upon Dr. G. Hare Philipson, president of the University of Durham College of Medicine, Newcastle-upon-Tyne.

PROF. J. R. CAMPBELL, head of the Agricultural Department of Yorkshire College, has been appointed under-secretary to the Department of Agriculture and Technical Instruction for Ireland.

THE honorary degree of D.Sc. has been conferred by the University of Oxford upon Prof. J. Mark Baldwin, of Princeton University, New Jersey, U.S.A. The new doctor is professor of psychology at Princeton, and editor of the *Psychological Review*.

HONORARY degrees were on Saturday last conferred by the Victoria University upon Lord Rayleigh, Sir William Huggins, Sir W. C. Roberts-Austen, Sir William Abney, Dr. T. E. Thorpe, Prof. J. Dewar, Prof. A. R. Forsyth, Mr. R. T. Glazebrook, Prof. Pickering, Prof. J. J. Thomson, and Mr. Henry Wilde.

A GRANT of 58*l.* from the Earl of Moray Endowment has been made by the Edinburgh University Court to Dr. J. H. Milroy for purposes of research. At a recent meeting of the Court it was announced that the late Prof. Sir D. MacLagan had bequeathed a marble bust of himself to the University, and that Miss E. A. Ormerod had presented six large volumes of drawings, chiefly by her father, to the library.

THE Drapers' Company offer for competition eight scholarships tenable at the day classes of the East London Technical College in chemistry, physics and engineering. The scholarships are of the value of 25*l.*, 10*l.* being paid during the first year and 15*l.* during the second year. They also carry with them free tuition. Particulars may be obtained from the Director of Studies, East London Technical College, People's Palace, E.

THE annual meeting terminating the session of the department of engineering in connection with University College, Liverpool, took place on Thursday last, when the William Rathbone Medal and the Rathbone Prizes were distributed by the Lord Mayor of Liverpool. The report, which was of a highly satisfactory character, was read by Prof. Hele-Shaw, after which an address was delivered by Prof. John Perry, F.R.S., upon the value of a thorough scientific education to the engineer.

THE following is a list of the members of the new Board of Education Consultative Committee :—Rt. Hon. Arthur Herbert Dyke Acland, Sir William Reynell Anson, Bart., M.P., Prof. Henry Armstrong, Mrs. Sophie Bryant, Rt. Hon. Sir William Hart Dyke, Bart., M.P., Sir Michael Foster, K.C.B., M.P., Mr. James Gow, Litt.D., Mr. Ernest Gray, M.P., Mr. Henry Hobhouse, M.P., Mr. Arthur Charles Humphreys-Owen, M.P., Sir Richard Claverhouse Jebb, M.P., Hon. and Rev. Edward Lyttelton, Very Rev. Edward Craigh Maclure, D.D., Dean of Manchester, Miss Lydia Manley, the Venerable Ernest Grey Sandford, Archdeacon of Exeter, Mrs. Eleanor Mildred Sidgwick, Prof. Bertram Coghill Alan Windle, M.D., Rev. David James Waller, D.D. The draft Order in Council, giving particulars of the duties, &c., of the Committee, has been issued as a Parliamentary paper.

FURTHER munificent gifts for the furtherance of education in the United States are announced in *Science* and are as follows:—The sum of 125,000 dollars has been left to Harvard University by the late Edmund Dwight. The bequest will come into the hands of the University authorities after the death of certain persons who receive the income during their lifetime. The amount (100,000 dollars) promised by Mr. Rockefeller to Denison University, on condition that 150,000 dollars additional be raised before July, has now been claimed, the sum named having been subscribed. The sum of 50,000 dollars has been given to Colorado College by Mr. W. S. Stratton; Mr. M. K. Jesup has given 25,000 dollars to Princeton University, and Lombard College in Galesburg, Ill., benefits in a like degree by the gift of Mr. W. G. Waterman; while 10,000 dollars have been subscribed by Messrs. Phelps, Dodge and Co. for the endowment of the department of mining and metallurgy at Columbia University. In addition to the foregoing it is announced that Mr. L. C. Smith will build and equip a civil engineering building in connection with Syracuse University.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 14.—“The Nature and Origin of the Poison of *Lotus Arabicus*.” By Wyndham R. Dunstan, F.R.S., Sec.C.S., Director of the Scientific Department of the Imperial Institute, and T. A. Henry, B.Sc.Lond.

Lotus Arabicus is a small leguminous plant resembling a vetch, indigenous to Egypt and Northern Africa. It grows abundantly in Nubia, and is especially noticeable in the bed of the Nile from